

## NOTULAE MALACOLOGICAE, XL

## MONTSERRATINA ORTIZ DE ZARATE LOPEZ, 1946 (PULMONATA, HYGROMIIDAE): A REDESCRIPTION (°)

MONTSERRATINA ORTIZ DE ZARATE LOPEZ, 1946 (PULMONATA, HYGROMIIDAE): REDESCRIPCION

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## ABSTRACT

The present authors redescribe the genus *Montserratina* Ortiz de Zárate López, 1946 and demonstrate it to be quite different from the genus *Nienhuisiella* Giusti and Manganelli, 1987. An attempt to establish the subfamilial status of *Montserratina* leads the authors to discuss the systematical problem of the Helicodontidae/Helicodontinae.

## RESUMEN

En el presente trabajo se redescrive el género *Montserratina* Ortiz de Zárate López, 1946, demostrándose así mismo que es bastante diferente del género *Nienhuisiella* Giusti y Manganelli 1987. Un intento de establecer la situación a nivel de subfamilia del género *Montserratina* conduce a los autores a discutir el problema sistemático de Helicodontidae/Helicodontinae.

Key Words: Pulmonata, Hygromiidae, *Montserratina*, Systematics.Palabras clave: Pulmonata, Hygromiidae, *Montserratina*, Sistemática.

## INTRODUCTION

While describing the new genus *Nienhuisiella* (Hygromiidae) for an endemic species in Sardinia (*N. antonellae* Giusti and Manganelli, 1987), we noticed it to remind the Spanish taxon *Montserratina* described by Ortiz de Zárate López (1946, p. 342) for a small species (*M. bofilliana* Fagot, 1884) found near Monistrol de Montserrat (Catalonia).

In the description by Ortiz de Zárate López *M. bofilliana* appeared similar to the Sardinian *N. antonellae*, not only because of its hairy shell

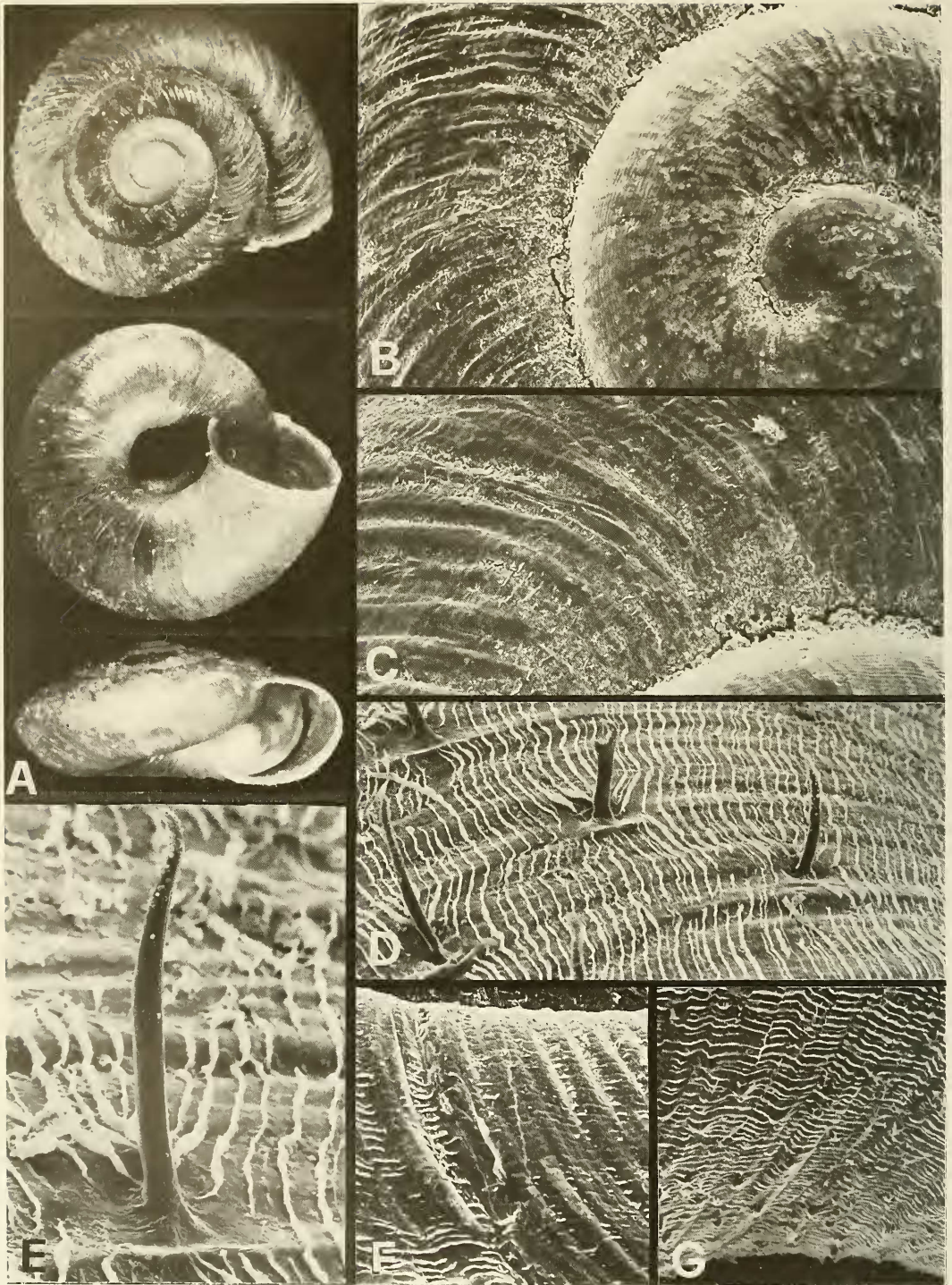
but also because of some peculiar anatomical features, particularly the absence of a dart-sac complex. Other characters were peculiar to the Spanish species (i.e. digitiform gland reduced to two units: one unbranched and the other divided into two branches, shorter penial flagellum, shoe-shaped bursa copulatrix), but these could be considered of lesser importance for systematics above the species-level (Manganelli and Giusti, 1988).

The lack of spirit materials and the consequent impossibility to check the Ortiz de Zárate López (1946) anatomical description suggested pru-

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PLATE I



dence to avoid inappropriate associations by describing *Nienhuisiella* as a separate genus.

Feeling ourselves obliged to reach a solution to the problem, we sought help from some Spanish colleagues. Recently, Mr. M. Bech Taberner, of Barcelona, sent us topotypical spirit materials of Fagot's species, collected by Mr. V. Bros. This material was used for our research and for the present redescription.

*GENUS MONSERRATINA ORTIZ DE ZARATE LOPEZ, 1946*

Type species: *Helix bofilliana* Fagot, 1884  
original designation

**DESCRIPTION**

Small hairy shell, brown in colour, depressed, convex below, with a very low conical spire of 4 1/2-5 slowly and regularly increasing whorls with deep sutures; last whorl angled at the periphery. Umbilicus wide, about 1/4 of the maximum diameter. Mouth oval; peristome not thickened, slightly reflexed at its lower margin.

External surface of the protoconch initially smooth, then patterned with many small spiral grooves; external surface of the teleoconch sulcated by fine, irregular growth lines. The periostracal layer shows several rows of hairs. The hairs near the peripheral angle of the whorls are longer. The entire periostracal layer has a microsculpture consisting of minute, narrow, more or less regularly spaced longitudinal crests.

The genital duct is characterized by a vagina of medium length and width, without any trace of stylophores; two or three tubular appendices arise

from the proximal portion of the vagina, each one of them with an independent very slender initial portion. One or two appendices arise from the vagina wall at a small distance from the other appendix. The initial portion of the latter is inserted in the base of a small laminar muscle, which connects the vagina with the columellar muscle. The two or three appendices are identical and appear to contain a mucous secretion. We consequently interpreted them all to be digitiform glands. The inner surface of the vagina walls shows a series of pleats, sometimes divided to form rows of irregularly shaped papillae (especially near the genital atrium). The bursa copulatrix duct is longer than the vagina (sometimes twice its length) and has a slender initial portion. The bursa copulatrix (= gametolytic gland) is wide and in virgin specimens it is always shoe-shaped. The penis (the portion of the penial complex from the genital atrium to the point where the penial retractor is inserted) is shorter than the epiphallus (the portion from where the penial retractor is inserted to the point where the vas deferens ends). The distal portion of the penis is dilated and enveloped by a thin muscular sheath. Inside the penis, a large penial papilla is present. It is cylindrical and shows a recorder mouthpiece-like apex and a subterminal opening. In transverse section, the penial papilla appears to be formed by two concentric rings separated by a moderately wide cavity; the lumen is centrally located. The inner surface of the penis walls is partly covered with pleats and partly with irregular papilla-like structures. The penial retractor is very short and robust. The penial flagellum is long, but shorter than the epiphallus. The right ommatophore retractor passes between penis and vagina. The penial nerve seems to start in the right pedal ganglion. The mantle collar has no

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PLATE I

*Montserratina bofilliana* (Fagot). A) Dorsal, umbilical and apertural view of the shell; B-G) Structure of the external shell surface; B: The protoconch and a portion of teleoconch (the protoconch is initially smooth and then patterned with numerous small spiral grooves which extend to the teleoconch whorls); C: a portion of the second whorl showing the longitudinal grooves and the corresponding small crests produced by the periostracal layer; D: a portion of the last whorl with spiral crests and hairs; E: a hair; F: a portion of the third whorl (note that the spiral crests are caducous and when missing the corresponding spiral grooves are revealed; G: a detail of the umbilical region (A X 9; B,F 85; C,D,G, X 110; E X 320).



peculiar feature when compared to the Hygromiidae.

The radula is formed by many rows, each one with 35-37 teeth. The central tooth has a wide basal plate and an apex with a wide-pointed mesocone and two small ectocones. The first lateral teeth also have a well defined basal plate, but their apex is constituted only by a wide and robust mesocone and a small ectocone. The successive latero-marginal teeth show a reduced basal plate and an apex formed by a slender mesocone and an ectocone. The marginal teeth are reduced and show a very small mesocone and an ectocone divided into 2-4 small points.

## EXAMINED MATERIAL

*Montserratina bofilliana* (Fagot): numerous sps. from Macizo de Montserrat (Barcelona, Spain), V. Bros leg. 2.1987 (Figs. 1-2, Pl. I: Figs. A-G, Pl. II: Figs. A-C).

## COMMENTS

The first problem to take care of in discussing *Montserratina* is the family in which to include this genus.

Two groups of helicoids can be considered as eventually including *Montserratina*: hygromiids and helicodontids. The first group has been traditionally considered to be a subfamily of the Helicidae. Recently, and thanks to a new interpretation of the anatomical features, Schileyko (1972a, 1972b, 1973, 1978a, 1978b, 1979) proposed it as a distinct family, the Hygromiidae, which is sometimes included in the Helicoidea (Schileyko, 1978a, 1978b) and other times in a superfamily of its own, the Hygromioidea (Schileyko, 1979). The opinion that the hygromiids represent a distinct family, the Hygromiidae, has

been accepted by some authors (i.e. Nordsieck, 1986; Giusti and Manganelli, 1987) while the superfamily Hygromioidea has been ignored or rejected (Giusti and Manganelli, 1987) (1).

The second group, the helicodontids, has been considered, and is sometimes still considered to represent a subfamily of the Helicidae (i.e., Hesse, 1918; Zilch, 1960; Gittenberger, 1968; Kerney et al., 1983). Some other authors have interpreted it to be a distinct family (Helicodontidae), at times belonging to the Helicoidea (i.e., Damianow and Likharev, 1975; Schileyko, 1978b) or to a superfamily of its own (Helicodontoidea) (Schileyko, 1979). More recently, Nordsieck (1986) considered it to belong to the family Hygromiidae. Some of the genera, which are commonly included in the two above mentioned groups (families or subfamilies according to the different authors) are known to be characterized by an extreme transformation or reduction, or even a complete loss, of the structures annexed to the vagina, principally represented by the dart-sac apparatus and the digitiform glands. Thus the collocation of these genera in one or other family/subfamily is frequently determined only on the basis of their shell features, although

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(1) According to Schileyko (1978a, 1978b) the Hygromiidae include a large number of subfamilies: Trichiinae, Hygromiinae, Archaicinae, Euomphaliinae, (*nomen novum pro Monachinae*), Paedhoplitinae, Metafruticicolinae, Ciliellinae, Cochlicellinae and Geomitrinae. Schileyko (*in litt.*) has recently changed his mind about the Cochlicellinae and Geomitrinae, which he now considers as separate families within the Helicoidea (*s. l.*). He also considers the Ciliellinae to represent a group of uncertain affinities.

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Fig. 1.— *Montserratina bofilliana* (Fagot). A-B) Genital ducts; C-D) Isolated digitiform glands. AG: Albumen gland; BC: Bursa copulatrix (= gametolytic gland); BW: Body wall; CBC: Bursa copulatrix duct; CM: Columellar muscle; DFG: Digitiform glands; E: Epiphallus; F: Flageillum; FO: Free oviduct; GA: Genital atrium; HD: Hermaphrodite duct; P: Penis; PO: Prostatic portion of the ovispermiduct; PP: Penial papilla (= glands); PR: Penial retractor muscle; PS: Penial sheath, PW: Penial wall; UO: Uterine portion of the ovispermiduct; V: Vagina; VD: Vas deferens; VR: Vaginal retractor, e.g. an accessory muscle which joins the vaginal walls to the columellar muscle.

these are known to be frequently subject to convergence phenomena and consequently less important for systematics above the species level. Unfortunately, sometimes even this meagre possibility fails. Some supposed helicodontids, e.g. *Oestophora*, *Canariella* and *Gasulliella*, have shells identical to certain hygromiids (i.e. *Odonototrema*, *Trichia*, *Perforatella*, *Platytheba*!).

The result is that the position of certain genera within the classification scheme is still a matter of opinion, tentative or, at best, based on features the true diagnostic value of which has still be determined.

Importance has been given in the past to the radular structure and sometimes also to the jaw (i.e. Hesse, 1918, 1931; Ortiz de Zárate Rocandio and Ortiz de Zárate López, 1961). The helicodontids have been described with two different types of radula: the *Helicodonta* and the *Oestophora-Caracollina* type. In the first type, the central tooth and the first lateral teeth have reduced endo- and ectocones; whereas in the second, the central tooth and the lateral teeth have small but evident endo- and ectocones. Personal observations of a number of species belonging to four genera of presumed helicodontids, i.e. *Helicodonta obvoluta* (Müller) (Pl. II: Figs. D-F), *Drepanostoma nautiliforme* Porro (Pl. III: Figs. A-C), *Caracollina lenticula* (Michaud) Pl. III: Figs. D-F), *Mastigophallus rangianus* (Ferussac), confirm the data in the literature and show that in both types the endocone develops, as we move from the first lateral teeth toward the latero-marginal teeth of each row of the radula, until it becomes an evident point flanking the mesocone tip. This phenomenon is clearest at the 10th-15th lateral teeth (see Ortiz de Zárate López, 1943, 1962; Gitteberger, 1980; Castillejo, 1984 for many species of the genera *Oestophora*, *Trissexodon*, *Gasulliella* and *Oestophorella*). However, this feature loses importance due to the fact that the same situation is found in some species of genera belonging to the Hygromiidae: e.g. *Hygromia (H.) cinctella* (Draparnaud) (see Giusti and Manganelli, 1987, Pl.

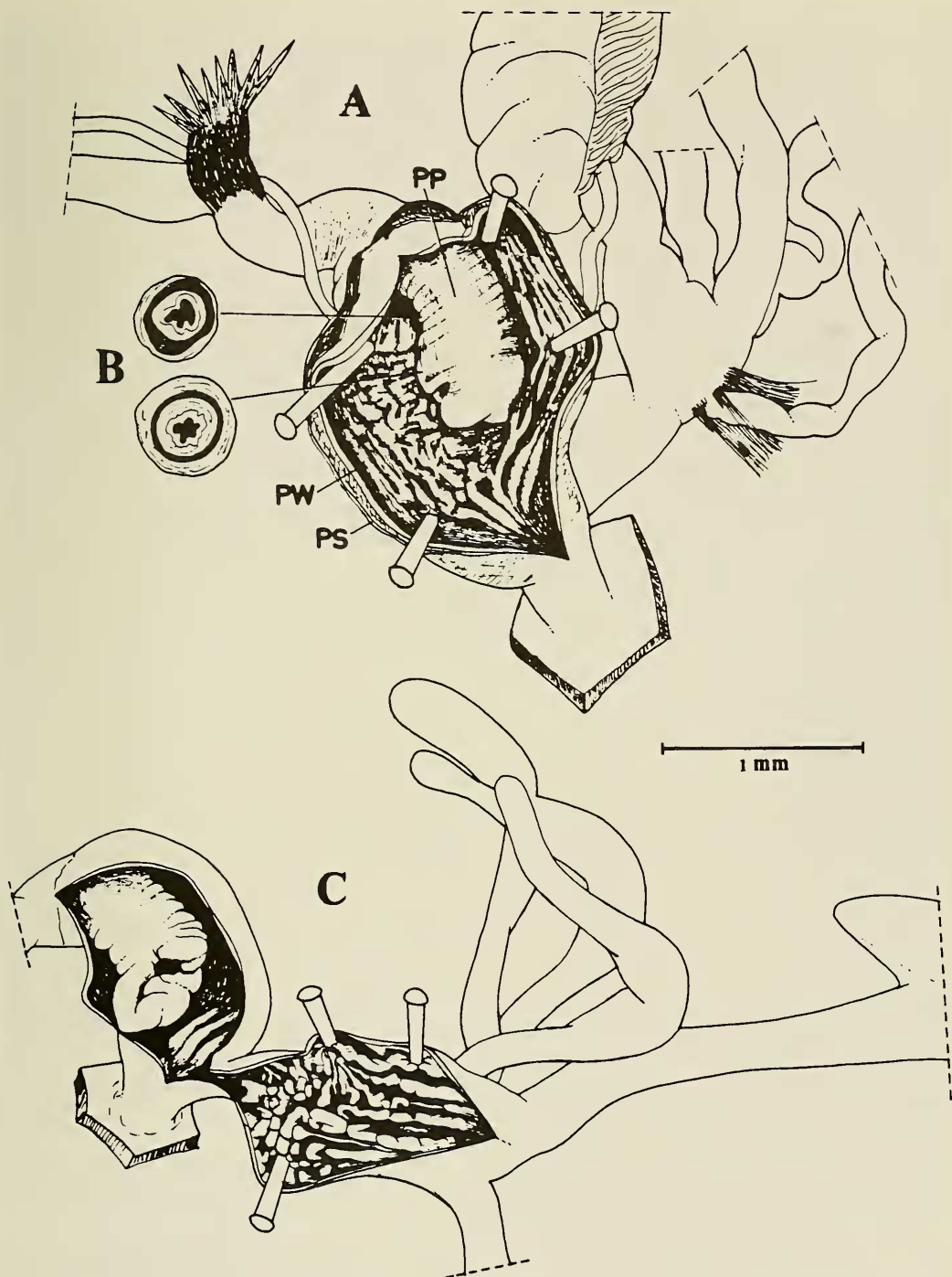
13, Figs. A-C) and *Trochoidea (T.) trochoides* (Poiret) (see Giusti, 1970, Pl. 12: Figs. 1-4).

The same happens in the case of the jaw. In the above mentioned species of supposed helicodontids examined by us (see Pl. IV: Figs. C-F), the jaw shows the apparently constant peculiarity of a few large ribs, whereas in some recently studied hygromiids the jaw has many small ribs (see Giusti and Manganelli, 1987, Pl. 12: Figs. E-H). Presumed helicodontids and hygromiids are known in the literature to have either types of jaw (Ortiz de Zárate López, 1962; Manga, 1983). This is widely confirmed by personal unpublished data on the jaw of several species belonging to some genera of the Hygromiidae (e.g. *Cernuella*) (see Pl. IV: Fig. B), which is similar to that of the helicodontids mentioned above. It is therefore difficult to decide whether the helicodontids represent a polyphyletic assemblage of genera derived from different groups of the hygromiids, each of them still belonging to the Hygromiidae, or a monophyletic but very heterogeneous distinct group, directly derived in the distant past from a hygromiid or from a common ancestor of the present Hygromiidae (Schileyko, *in litt*).

According to Schileyko (1978b), if we exclude some problematic taxa such as *Trissexodon*, *Mastigophallus*, *Oestophorella* and perhaps also *Oestophora* and *Canariella* as well (genera having apparently typical hygromiid features: dart-sac complex, epiphallus and penial flagellum, penial papilla), the helicodontids should represent a family (the Helicodontidae) substantially differentiated from the Hygromiidae by two features: the absence of an epiphallus and the penial papilla. Schileyko's opinion is unacceptable for us by a number of reasons.

First of all, it is our opinion that any conclusion is premature because there are not enough data about the anatomy of too many species. A preliminary study by us has revealed that the part usually called epiphallus is apparently absent in *Helicodonta* and *Drepanostoma*, but it is well evident in *Caracollina*! Here we defi-

Fig. 2.— *M. bofilliana* (Fagot). A) The penis has been opened to show the penial papilla and the inner structure of the penial walls; B) Sections at different levels of the penial papilla; C) The penis and the vagina have been dissected in order to show the penial papilla and the inner structure of the vaginal walls respectively (For explanation of the symbols, see Fig. 1).



ne the epiphallus as the portion of the penial complex from the retractor insertion to where usually the vas deferens ends and the penial flagellum arises. This portion is present in the Hygromiidae and in the following supposed helicodontid genera: *Mastigophallus*, *Trissexodon*, *Oestophorella* and *Canariella*. The proximal portion of the "penis" (circumvolved and enveloped in the penial sheath in *Helicodonta*, *Drepanostoma* and *Oestophora* may constitute an epiphallus which would not correspond to the one defined above, only because of the modified insertion point of the penial retractor.

The same happens with the penial papilla. If the small "penial papilla-like structure", described by Schileyko (1971, 1978b) in *Helicodonta*, is non-homologous with that of the Hygromiidae, the one found by us in the penis of *Caracollina* seems on the contrary to be homologous. *Caracollina*, supposed by Schileyko to represent a typical Helicodontidae/helicodontinae, seems on the other hand to be morphologically closer to the Spanish taxa, which were supposed again by Schileyko to be related to the Hygromiidae.

We hope it is now clear why we reject Schileyko's classification-scheme of the helicodontids and why we consider absurd any attempt to propose a new scheme without a thorough anatomical analysis of the entire group.

*Montserratina* can be interpreted as an emblematic genus. It shows an epiphallus and true penial papilla corresponding to those of the hygromiids, a group with digitiform glands which are similar to those of the helicodontids, and a peculiar feature: the muscle connecting the vagina walls to the columellar muscle.

This taxon thus appears to stand between the hygromiids and the helicodontids, perhaps a little closer to the hygromiids. The problematic position of genera such as *Mastigophallus*, *Trissexodon*, *Oestophorella*, *Oestophora* and *Canariella* can be taken as an evidence for the impossibility of distinguishing the helicodontids from the Hygromiidae and the paraphyletic nature of

the subfamily Helicodontinae, as it has been considered until now. It seems possible to us that reduction phenomena of vaginal structures and the penial papilla, and transformation of the penial complex structure have taken place many times within different hygromiid groups. This phenomenon may have given rise to quite independent processes of "helicodontization" and consequently to phylogenetically different genera, even sometimes anatomically more or less similar. If we provisionally accept (see Giusti and Manganelli, 1987) Schileyko's subfamilial division of the Hygromiidae, the problem of where to include *Montserratina* remains. Apparently there is only one possible answer: in a distinct subfamily, close to the subfamilies into which the present "Helicodontinae" will have to be divided (the Helicodontinae have to be eventually limited to the genera *Helicodonta* and *Drepanostoma*).

We abstain from any conclusion on this subject, preferring to leave *Montserratina* as an *incertae sedis* taxon within the Hygromiidae. As explained above, more research is necessary in order to verify Schileyko's subfamilial division of the Hygromiidae and to clarify the phylogenetic relationships between the different helicodontid genera.

The aim which led us to revise *Montserratina* Ortiz de Zárate López, 1946 has nevertheless been attained. This taxon cannot be confused with *Nienhuisiella* Giusti and Manganelli, 1987. *Montserratina* is differentiated by the following features:

1) a vagina without any trace of a dart-sac complex, whereas *Nienhuisiella* shows a sort of sac like diverticulum near the base of the digitiform glands which can be interpreted as a dart sac-complex residue.

2) unbranched digitiform glands consisting of three tubular elements, two of them arising very close each other but slightly spaced from the remaining one.

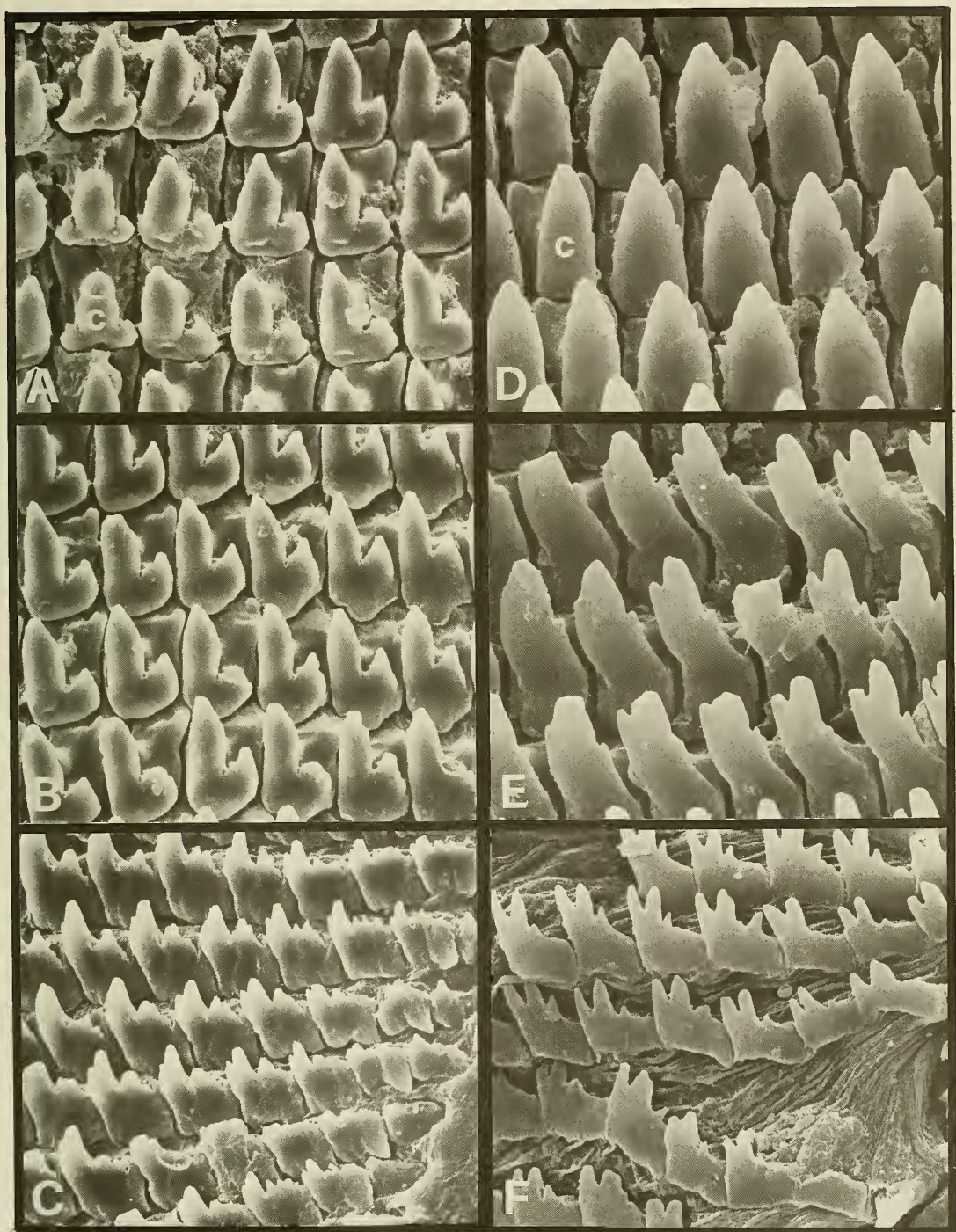
3) a short muscle connecting the vagina walls

## PLATE II

A-C) Radula of a specimen of *M. bofilliana* (Fagot); D-F) Radula of a specimen of *Helicodonta obvoluta* (Müller) (from Bosco di Rezzo, Imperia, Italy). A,D: central tooth (c) and first lateral teeth; B: 7th to 12th lateral teeth; C,F: extreme marginal teeth; E: 12th to 17th lateral teeth (A-F X 900).



PLATE II



to the columellar muscle.

4) penial walls externally enveloped by a thin muscular sheath.

5) a very short penial retractor muscle.

6) the penial papilla recorder-mouthpiece shaped and with a subterminal opening. In transverse section the penial papilla consists of two concentric rings which are separated by a moderately wide cavity. *Nienhuisiella* shows a penial papilla with an apical opening and thick walls with some lacunae.

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## PLATE III

A-C) Radula of a specimen of *Drepanostoma nautiliforme* Porro from Val Sassera (Vicenza, Italy); D-F) Radula of a specimen of *Caracollina lenticula* (Michaud) from Isola del Giglio (Tuscan Archipelago, Italy). A,D: central tooth (c) and first lateral teeth; B: 9th to 16th lateral teeth; C,F: extreme marginal teeth; E: 7th to 11th lateral teeth (A-F X 900).

## PLATE IV

Jaw in specimens of: A) *M. bofilliana* (Fagot) from Monistrol de Montserrat (Spain); B) *Cernuella cf. virgata* (Da Costa) from Vizcaya (Spain); C) *Helicodonta obvoluta* (Müller) from Bosco di Rezzo (Imperia, Italy); D) *Drepanostoma nautiliforme* Porro from Val Sassera (Vicenza, Italy); E) *Caracollina lenticula* (Michaud) from Isola del Giglio (Tuscan Archipelago, Italy) and F) *Mastigophallus rangiana* (Férussac) from Banyuls (France) (A X 130; B X 50; C,F X 70; D X 90; E X 110).

PLATE III

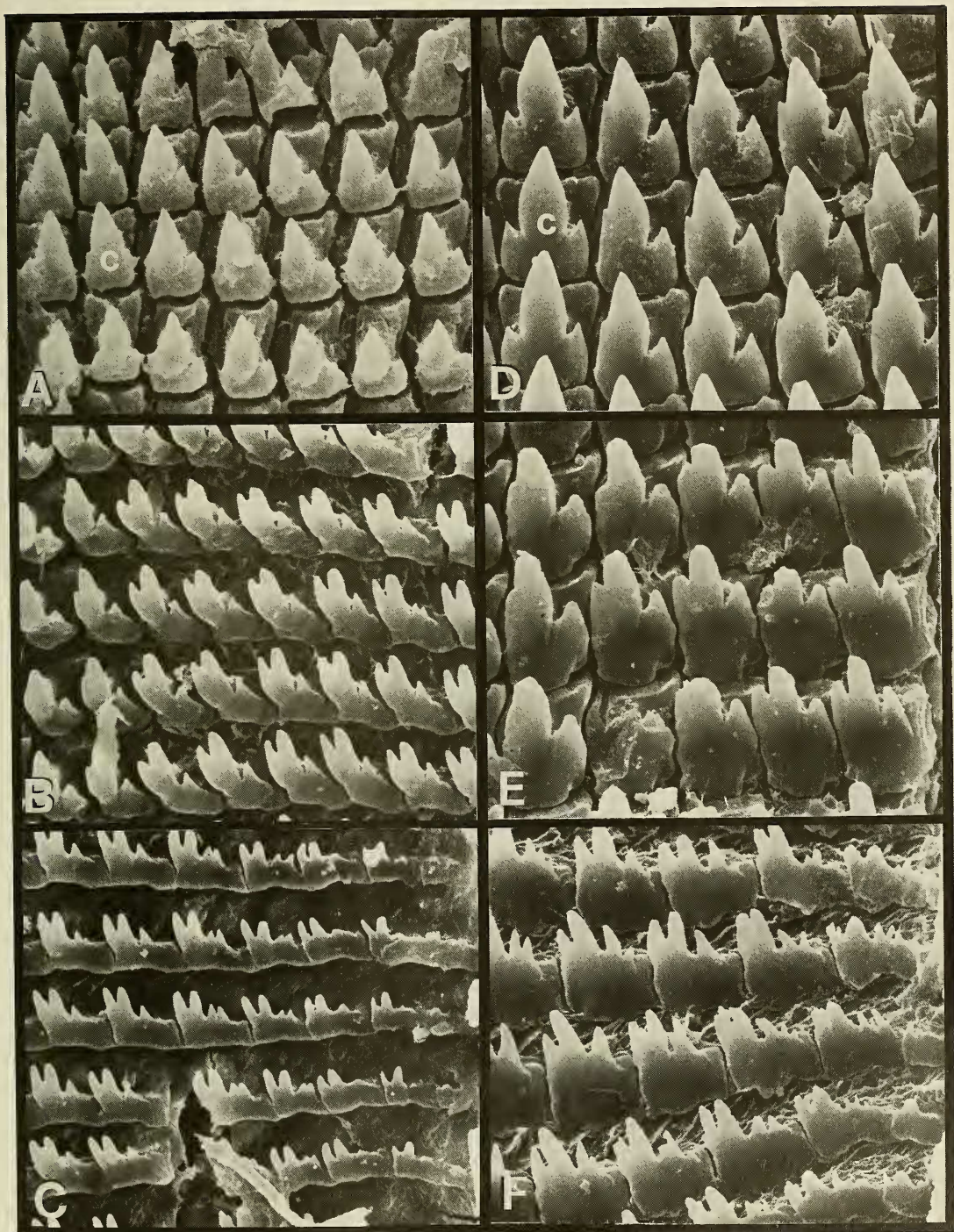


PLATE IV

